

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-262240

(43)Date of publication of application : 29.09.1998

(51)Int.Cl.

H04N 7/18
B60R 1/00
// G08G 1/16

(21)Application number : 09-063582

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(22)Date of filing : 17.03.1997

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(54) VEHICLE USE SURROUNDING VISUAL RECOGNITION DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a vehicle use surrounding visual recognition device of a simple configuration by which an image in a visual field of a vehicle side in a direction corresponding to an approaching angle to a crossing or the like is surely obtained.

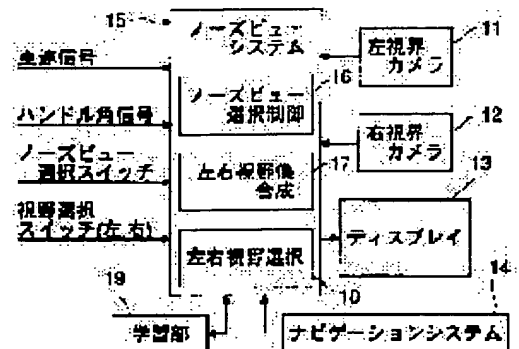
SOLUTION: This device is provided with cameras 11, 12 that pick up visual fields of the left and right sides of a vehicle respectively and a visual field setting means that sets a direction of a noteworthy visual field in the visual field of the left and right sides by the cameras 11, 12.

The device extracts partially an image of the noteworthy visual field in a set direction from each visual field image and arranges the images of the noteworthy visual fields to form one display image and to

display the image on a display device 13. The visual field setting means especially sets variably a direction of the noteworthy visual

field according to an instruction from a selector switch operated

manually or sets the direction of the noteworthy visual field according to approaching angle information of the vehicle to a crossing indicated by navigation information, according to a steering wheel angle information of the vehicle or the like.



LEGAL STATUS

[Date of request for examination]	28.03.2000
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3284917
[Date of registration]	08.03.2002
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is carried in the anterior part or the back of a car, picturizes the field of view of the method of left right-hand side of this car, and relates to the circumference check-by-looking equipment for cars which shows an operator the visual field image of the method of left right-hand side.

[0002]

[A related background technique] Recently, the field of view of the method of the left right-hand side in the anterior part or the back of this car is picturized with the camera carried in the anterior part or the back of a car, and development of the circumference check-by-looking equipment for cars which displays the image using the display prepared in the interior of a room of this car is furthered. since it can check from the image obtain from the operator interrupt by the wall 2 grade of route (alley) both sides with the camera in which the right and left field of view ahead of the car which cannot be see directly be established by the anterior part of this car according to this kind of equipmen in case a car 1 advance into a crossing from an alley etc. as show , for example in drawing 5 , the effectiveness of being able to raise the safety at the time of the penetration to that crossing be do so .

[0003]

[Problem(s) to be Solved by the Invention] By the way, as for the camera built into this kind of circumference check-by-looking equipment for cars, the sense of that field of view is usually defined uniquely. As shown in drawing 6 , when the penetration include angle of the car 1 to a crossing leans greatly for this reason, there is a possibility that the image of the sense made into the check object may no longer be obtained. Since the right-and-left both ends of the above-mentioned front grille will generally interrupt the back field of view of a camera when especially a camera makes the transverse-plane center section of the front grille of a car project and is formed, there are sense made into the check object, especially a problem referred to as that the image of slanting back seen from car anterior part is hard to be obtained.

[0004] In order to change the sense of the field of view of the image pick-up with a camera incidentally, the movable device for changing into a machine point the sense in which a camera carries out a visual field is needed, and the configuration is complicated. On the other hand, the angle of visibility of a camera is greatly set up with 90 degrees or more, and the large field of view of the car side is beforehand secured so that it may be indicated by JP,7-192200,A, for example, and it considers displaying only the image of the particular part in this input image. However, if the image of such a large angle of visibility is inputted, it cannot deny producing a big distortion to the periphery of the input image, especially an image field on either side. Therefore, in case especially the image of the periphery is cut down in case an image is selectively extracted and displayed out of an input image, and it displays, it will become large-scale [the configuration] that a distortion compensator is needed for obtaining a natural display image without sense of incongruity etc.

[0005] This invention was made in consideration of such a situation, and the object is in offering the circumference check-by-looking equipment for cars of an easy configuration of that the image of the car side of the sense according to the penetration include angle to a crossing etc. can be obtained exactly.

[0006]

[Means for Solving the Problem] The car circumference check-by-looking equipment applied to this invention in order to attain the object mentioned above An image pick-up means to picturize the visual field which is attached in the

anterior part or the back of a car, and is equivalent to field of view [the less than 90-degree predetermined field of view in the method of left right-hand side of this car], for example, angle of visibility, natural viewing, respectively, A visual field setting-out means to set up the sense of the attention visual field field in each field of view of the method of said left right-hand side when it picturizes with this image pick-up means which should be observed especially, respectively, Furthermore, an image composition means to extract selectively the image of the attention visual field field of the sense set up with said visual field setting-out means, respectively out of each field-of-view image picturized with said image pick-up means, to put the image of these attention visual field fields in order, and to form the display image of one sheet, It is characterized by having a display means to be formed in the interior of a room of said car, and to display said display image.

[0007] It is characterized by establishing the means which carries out adjustable setting out of the sense of the attention visual field field in each field-of-view image of said method of left right-hand side in response to the actuation of a selecting switch by which manual operation is carried out to said visual field setting-out means so that it may indicate especially to claim 2. Moreover, the information on the transit environment of the car detected by said visual field setting-out means with an environmental detection means so that it may indicate to claim 3, For example, it is characterized by establishing a means to set up the sense of the attention visual field field in the field-of-view image of said method of left right-hand side according to angle-of-approach information on the car to a crossing, handle angle information on a car, etc. which are shown using navigation information.

[0008] Namely, the car circumference check-by-looking equipment concerning this invention sets up the sense of the visual field field which should be observed according to the transit environment of cars, such as an angle of approach to a crossing. Out of each visual field image in the method of left right-hand side of the car picturized with an image pick-up means (camera) It is characterized by extracting selectively the attention visual field image of the sense of the above-mentioned visual field field, respectively, putting each of these attention visual field images of the method of left right-hand side in order, forming the display image of one sheet, and making it display on a display means (display).

[0009] the actuation of a selecting switch by which manual operation is especially carried out in the sense of said visual field field -- or even if it is a case as an inclination is in the angle of approach of the car to a crossing, it enables it to obtain certainly the side image of the sense considered as a request by carrying out adjustable setting out according to transit environments shown using navigation information, such as angle-of-approach information on the car to a crossing, and handle angle information on a car

[0010]

[Embodiment of the Invention] the circumference check-by-looking equipment for cars hereafter applied to 1 operation gestalt of this invention with reference to a drawing -- a nose -- view equipment is explained to an example. in addition the nose which picturizes the field of view of the method of left right-hand side of this car with the camera formed in the anterior part of a car here -- although view equipment is explained to an example, it is applicable also like the car back right-and-left view equipment which picturizes the field of view of the method of left right-hand side of this car with the camera formed in the back of a car.

[0011] drawing 1 -- a nose -- it is drawing showing the functional outline configuration of view equipment, and 11 and 12 are the left field-of-view cameras and right field-of-view cameras as an image pick-up means which are attached in the anterior part of a car and picturize the field of view of the method of left right-hand side of this car, respectively. Especially each of these cameras 11 and 12 are built into the before- [the front fender of a car] side by the slitting part on the extension wire of a front bumper etc., and as each cameras 11 and 12 show to drawing 2, the field of view of the method of anterior part left right-hand side of a car 10 is being picturized, respectively.

[0012] The field-of-view angles floor line and FR of each of these cameras 11 and 12 are set as the range of natural viewing (visual field which human being can check by looking in the natural condition) of less than 90-degrees of horizontal directions, and are defined as an angle of visibility which is equivalent to a standard lens from the so-called wide angle lens. That is, the angles of visibility floor line and FR of each cameras 11 and 12 are defined as an angle of visibility which bundles up and can picturize the field of view of the method of the left right-hand side in the anterior part of a car 10, without producing most geometric distortion about the lines of sight (horizontal).

[0013] On the other hand, especially, it is included in an instrument panel, a console panel, etc. ahead of a driver's seat, and the display 13 as a display means of an image consists [the interior of a room of a car 10, and] of a liquid crystal display. It is used for presenting of the navigation information (map information which shows a route, a self-vehicle location, etc. around a self-vehicle) by the navigation system 14 mentioned later etc. while the display of the field-of-

view image of the method of the left right-hand side mentioned above is presented with this display 13.

[0014] now, the nose by which the place by which this equipment is characterized is built by the microprocessor etc. -- the view system 15 -- setting -- especially -- a nose -- it is a point equipped with the view selection-control function 16, the right-and-left visual field image composition function 17, and the right-and-left visual field optional feature 18, and is in the point further equipped with the study section 19 as an ancillary function. the above -- a nose -- the view selection-control function 16 is a function to control, and mentions later whether image display based on the field-of-view images VL and VR of the method of anterior part left right-hand side of the car 10 by which an image pick-up input is carried out is performed using said display 13 with the cameras 11 and 12 mentioned above -- as -- a vehicle speed signal and a nose -- the selection control is performed based on the directions information from a view selecting switch etc. Moreover, the right and left visual field image composition function 17 form the display image D of one sheet which display the attention visual field images DL and DR cut down, respectively so that it might mention later on said display 13 side by side from the field of view images VL and VR of the method of anterior part left right-hand side of the car 10 by which the image pick-up input be carried out with said cameras 11 and 12. Furthermore, said right-and-left visual field optional feature 18 bears the role which carries out selection setting out of the field of the field-of-view images VL and VR to the attention visual field images DL and DR of the above-mentioned method of anterior part left right-hand side cut down selectively, and performs control of the field setting out according to the directions information from a handle angle signal or a visual field selecting switch.

[0015] Moreover, said study section 19 learns the gestalt (operating state) of each above-mentioned functions 16 and 17 and actuation of 18 according to the transit environment which can be acquired from a navigation system 14. this study section 19 -- for example, the nose in a specific crossing -- an activity, a situation of an activity, etc. of a view function (gestalt) collect as hysteresis information -- having -- which crossing -- what kind of gestalt -- a nose -- it is learned whether a view function is used. this study result -- said subsequent nose -- it is used for the automatic control of each of said functions 16, 17, and 18 in the view system 15.

[0016] thus -- if the operation is explained in more detail to be the function of the circumference check-by-looking equipment for cars (nose view equipment) built according to the fundamental flows of control shown in drawing 3 -- a nose -- view processing -- fundamental -- a nose -- [step S1] started from judging whether the view selecting switch is chosen (ON). a nose -- the case where a view selecting switch is not chosen (off) -- this -- a nose -- the study result by said study section 19 although this processing is stopped or especially flows of control are not shown until a view selecting switch is chosen (ON) -- being based -- a nose -- view control is performed. the nose based on this study result -- about view control, it mentions later.

[0017] a deer -- carrying out -- a nose -- [step S2] which judges next whether the vehicle speed at that time is a low speed of 20 or less km/h based on a vehicle speed signal when the view selecting switch is chosen (ON). this judgment -- a nose -- the operating environments which need a view are times of carrying out low-speed transit, such as the time of the penetration to the bad crossing of a prospect, and it is based on the check of the right-and-left field of view of car anterior part being almost needlessness at the time of high-speed transit. If it puts in another way, when the right-and-left field of view of car anterior part needs to be checked, naturally it slows down and is based on it being in the condition halted [which has halted and has low-speed-run]. therefore -- the case where the car 10 is carrying out high-speed transit -- a nose -- view processing is stopped.

[0018] such a nose -- the nose by the on-off judgment of a view selecting switch, and vehicle speed judging -- the selection control to actuation of a view function -- said nose -- it performs by the view selection-control function 16. and this nose -- the view selection-control function 16 -- a nose -- [step S3] which will judge whether the visual field selecting switch is chosen next (ON) if a requirement when operating a view function is judged.

[0019] The visual field selecting switch is formed corresponding to each of for example, a left field of view and a right field of view, and the above-mentioned judgment processing [step S3] is judged as modification of the sense of the attention visual field over each field of view of the method of left right-hand side being directed, when one of these is chosen at least. Moreover, if there is a visual field selecting switch un-choosing (off), it will be judged with there being no exceptional modification directions to the sense of an attention visual field. Such a judgment result is given to said right-and-left visual field optional feature 18.

[0020] The right-and-left visual field optional feature 18 carries out modification setting out of the sense AL and AR of the attention visual field in each fields of view floor line and FR of the method of left right-hand side according to the directions, when such a judgment result is obtained and modification directions of an attention visual field are given

[step S4]. And the partial images DL and DR of the predetermined angles of visibility PL and PR on the basis of the above-mentioned sense AL and AR are selectively extracted, respectively out of the field-of-view images DL and DR of said method of anterior part left right-hand side.

[0021] moreover, when modification directions of an attention visual field are not given For example, the sense AL and AR of the attention visual field defined as a default is followed. Or the sense AL and AR of the attention visual field set up according to a handle angle. Or the field of the partial images DL and DR of the predetermined angles of visibility PL and PR is pinpointed in order to carry out a selection extract according to the sense AL and AR of the attention visual field set up according to the penetration include angle to the crossing shown using navigation information out of the field-of-view images VL and VR of said method of left right-hand side-[step S5]. And the partial images DL and DR of the sense AL and AR of the above-mentioned attention visual field are extracted, respectively out of each field-of-view images VL and VR of the method of the left right-hand side by which an image pick-up input is carried out with said cameras 11 and 12.

[0022] ~~The right-and-left visual field image composition function 17 lines up side-by-side the partial images DL and DR called for out of each field-of-view images VL and VR of the method of left right-hand side, as mentioned above, and it forms the display image D of one sheet. This display image D is given to said display 13, image display is made, and an operator is shown. The alternative extract of the partial images DL and DR out of the field-of-view images VL and VR of the method of the left right-hand side mentioned above, If it explains now somewhat in detail about composition of the extracted partial images DL and DR This processing out of the field-of-view images VL and VR of the method of the left right-hand side shown by the fields of view floor line and FR by which the image pick-up input was carried out with cameras 11 and 12 as shown in drawing 4 It realizes by extracting selectively the image of the field pinpointed with the sense AL and AR and angles of visibility PL and PR of an attention visual field as partial images DL and DR.~~

[0023] It is set up according to the penetration include angle to the crossing which a deer is carried out, adjustable setting out of the sense AL and AR of an attention visual field is carried out by actuation of a visual field selecting switch as mentioned above, and is shown using a handle angle or navigation information. When the sense AL and AR of an attention visual field is set up, thus, the image of the predetermined angles of visibility PL and PR defined on the basis of the sense AL and AR It is equivalent to the partial images DL and DR at the time of making the location of the image field of the specific width of face in the field-of-view images VL and VR of the method of the left right-hand side shown by said fields of view floor line and FR (equivalent to angles of visibility PL and PR) slide to right and left exactly according to the sense AL and AR of an attention visual field.

[0024] then, the nose concerning this operation gestalt -- view equipment Out of the field-of-view images VL and VR of the method of the left right-hand side by which an image pick-up input is carried out fixed with cameras 11 and 12 As mentioned above, according to the sense AL and AR of the attention visual field set up, the partial images DL and DR are extracted selectively, ~~the display image D of one sheet is formed by putting these partial images DL and DR in order, and this is expressed as the display 13.~~

[0025] Therefore, according to this equipment, as shown in drawing 6 mentioned above, even if it is the case where the penetration include angle of the car 10 to a crossing leans, the image of the car side of the sense according to the penetration include angle can be obtained. And the images DL and DR of the lines of sight considered as the request of the car side can be obtained, without changing the sense of the field of view of a camera 11 and 12 the very thing. Therefore, the device section for changing the sense of the visual field of cameras 11 and 12 etc. is completely unnecessary, and since what is necessary is just to attach cameras 11 and 12 in the front fender etc. fixed as mentioned above, large simplification of the configuration can be attained.

[0026] Moreover, even if it faces extracting selectively the partial images DL and DR according to the sense AL and AR of an attention visual field out of the field-of-view images VL and VR of the method of left right-hand side Since said field-of-view image VL and VR itself do not have almost distortion about the lines of sight (horizontal) It is unnecessary to perform distortion amendment according to the logging location of the partial images DL and DR, and natural gender is high only by only cutting down the partial images DL and DR of predetermined width of face out of the field-of-view images VL and VR, that is, a car side image without sense of incongruity can be obtained. Therefore, status tracking of the method of the left right-hand side in the car anterior part from the car side image shown by the partial images DL and DR can be made easy. Since a setting-out change can be easily made by the manual operation of a visual field selecting switch especially about the sense AL and AR of an attention visual field, the method image of

left right-hand side of the optimal sense according to various road environment can be obtained easily, and big effectiveness is done so when checking simply and exactly the safety of the method of the left right-hand side in a crossing etc.

[0027] Moreover, as mentioned above, even if it is the case where said visual field selecting switch is not operated (ON), for example according to a handle angle, the sense AL and AR of an attention visual field is set up. incidentally it is at the penetration time to a crossing, and it becomes possible, if the sense AL and AR of an attention visual field is amended according to the handle angle, since the sense of a car 10 leans to the direction of the route in many cases when it is alike, it sets by the case where the situation of the side of a car 10 needs to be checked and the wheel is already turned to obtain the image of the car side more exactly.

[0028] Furthermore, in this equipment, the sense AL and AR of an attention visual field can be set up now based on navigation information. What is necessary is just to make it set up the sense AL and AR of said attention visual field based on this information, since the sense of the car side can be specified that it should check at the crossing concerned by this, if the crossing into which tends to be followed, for example, a car tends to advance using navigation information, and the penetration include angle to that crossing are shown. Moreover, when it is shown as a study result in said study section 19 that the crossing specified using navigation information is a crossing where the side check of the sense AL and AR of a specific attention visual field was set up and carried out in the past, according to the study result, it may be made to carry out automatic setting of the sense AL and AR of said attention visual field.

[0029] therefore, the nose concerning this operation gestalt -- according to view equipment, great effectiveness is done so, when the situation of the car side can be caught exactly and insurance transit is secured at the time of the penetration to various crossings, since the image of the car side of the sense according to that situation can be obtained as a high image of the natural gender which does not have distortion simple moreover. In addition, this invention is not limited to the operation gestalt mentioned above. For example, it is inclusion about a camera to the quarter panel outer of the car back etc. The method field of view of left right-hand side in the car back is picturized similarly, and may be made to carry out image display. Moreover, although sense AR of an attention visual field to a right field of view may be set up, or you make it setting out of the sense AL of the attention visual field over a left field of view interlocked with, the sense AL and AR of an attention visual field is mutually interlocked due to the reverse and you may make it set-up, you may make it set up the sense AL and AR of the attention visual field over each field of view on either side mutually-independent. Moreover, it is desirable to give priority to actuation of a visual field selecting switch, and to perform the setting-out control about setting out of the sense AL and AR of an attention visual field. In addition, in the range which does not deviate from the summary, this invention can deform variously and can be carried out.

[0030]
[Effect of the Invention] As explained above, while picturizing the predetermined field of view in the method of left right-hand side of this car with the camera attached in the anterior part or the back of a car, respectively according to this invention, he is trying to set up the sense of the attention visual field field in each field of view of the method of said left right-hand side when it picturizes with the above-mentioned camera with a visual field setting-out means. And the image of the attention visual field field of the sense set up with said visual field setting-out means is extracted, respectively out of each field-of-view image picturized with said camera, the image of these attention visual field fields is put in order, the display image of one sheet is formed, and it expresses as a display means by which this was prepared in the interior of a room of a car.

[0031] Therefore, according to this invention, without carrying out adjustable [of the sense of the visual field of the camera itself], the side image of the attention visual field of the sense considered as a request is obtained, and this can be compounded in the image of one sheet and it can indicate by package. Therefore, the situation of the car side which simplifies and is needed exactly can be checked, and great effectiveness is done so on a safety check. Especially in a visual field setting-out means, according to the directions information from the selecting switch by which manual operation is carried out, adjustable setting out of the sense of the attention visual field field in each field-of-view image is carried out, and since the sense of an attention visual field field is set up according to the transit environment of the car further detected by the environmental detection means, the effectiveness of being able to obtain certainly the image of the car side of the sense according to a transit environment is done so.

[Translation done.]

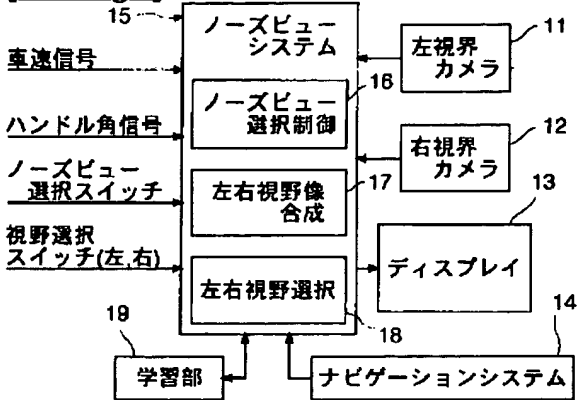
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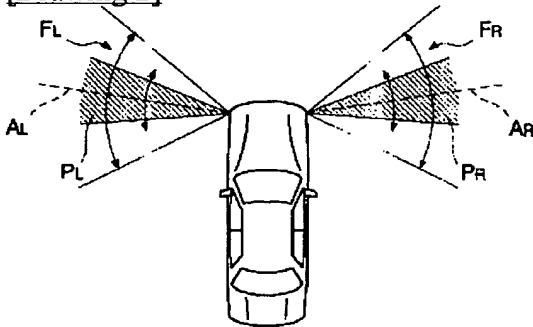
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DRAWINGS

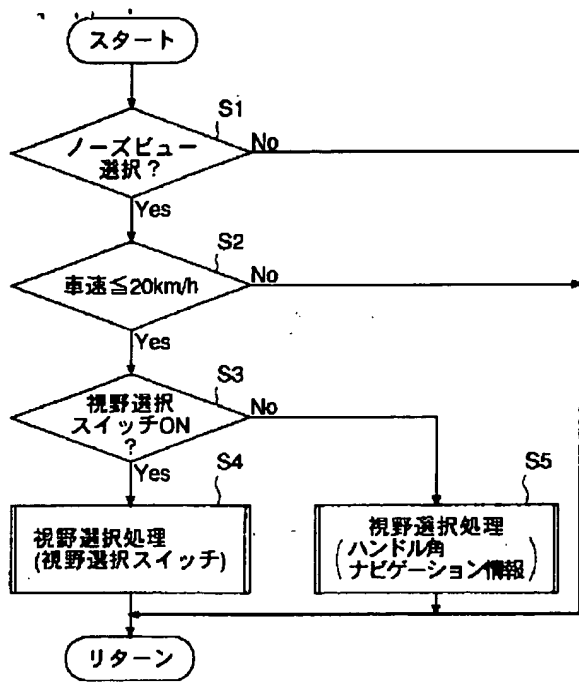
[Drawing 1]



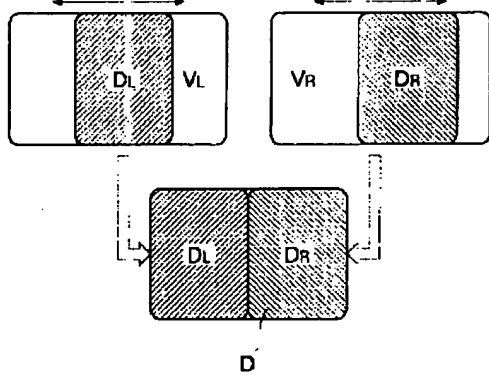
[Drawing 2]



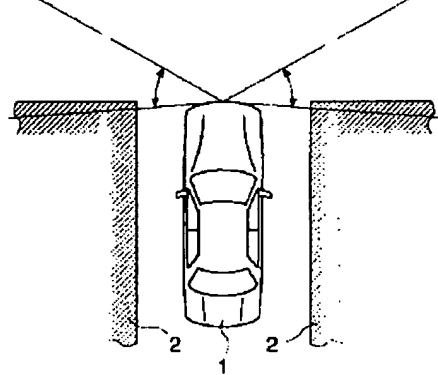
[Drawing 3]



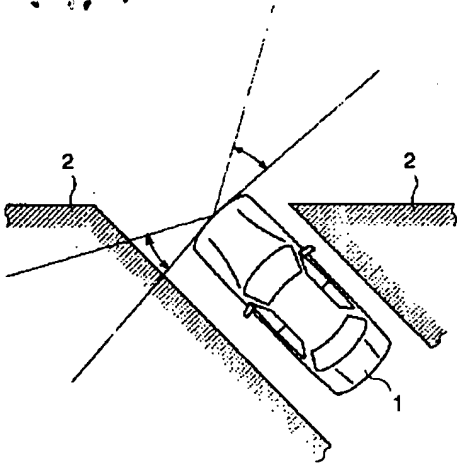
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]